
NAAMLP 2017
39TH ANNUAL CONFERENCE

NATIONAL AWARD

THE HULING BRANCH AML RECLAMATION PROJECT

Patrick Webb, P.E. and Richard Beam, P.G. Pennsylvania Department of Environmental Protection

The Huling Branch AML Reclamation/ ATV Recreation & Watershed Improvement Project was one of the most extensive and complex surface mine reclamation projects undertaken by the Pennsylvania Abandoned Mine Land (AML) program to date. The project addressed three major concerns that were associated with the 103-acre AML site located in the heart of Pennsylvania's 307,140-acre Sproul State Forest, that is maintained by the Pennsylvania Department of Conservation and Natural Resources (PA DCNR), Bureau of Forestry.

The first and primary concern was to eliminate four Priority 2 (P2) near vertical dangerous highwalls (DHs) from past surface mining that were in excess of 70 feet (ft.) in height and had a combined length of over 6,000 linear feet (L.F.). Associated with the four separate DHs was a massive 103-acre Priority 3 (P3) spoil area (SA) which contained a large amount of acid forming materials. During the surface mining, collapsed entries that were discharging highly contaminated acid mine drainage (AMD) from previously underground mined areas were intersected. The backfilling and reforestation reclamation plan reclaimed the DHs and SA by utilizing both the Forestry Reclamation Approach (FRA) and conventional backfill/compaction methods. Located all around and on top of the DHs and SA were segments of the 50- mile-long PA DCNR Whiskey Springs All-Terrain Vehicle (ATV) trail system and a 40-acre ATV "play area." The recreational use of the trail system and play area had attracted intense public visitation to areas off of the designated trail to the area containing the DHs and SA. The unauthorized use of the AML site by ATV riders and others resulted in numerous ATV accidents and injuries, several of which required a life flight helicopter to transport the victims. The reclamation plan eliminated access to the unauthorized ATV riding areas and re-established and maintained portions of the Whiskey Springs ATV trail that were impacted by the construction of the project.

The second concern was to maintain and re-establish 3.6 miles of the project construction site access that is a functioning segment of the Whiskey Springs ATV trail system. Portions of the DHs and SA reclamation plan were intersected by the ATV trail. This section of the trail was closed to the public during construction of the project. The 3.6-mile dual use of the rehabilitated and maintained construction site access/ATV trail was restored after construction to promote recreational and economic redevelopment. The trail is open for recreational use from Memorial Day to the last weekend in September and is reopened mid-January to April 1. Portions of the trail are also used for the annual Rattlesnake National Enduro which is the 5th of 9 rounds of the 2017 Kenda American Motorcyclist Association (AMA) National Enduro Championship Series. The national race begins in Cross Fork, PA, which is one-half hour north of the Huling Branch AML site. The national race is sponsored locally by the Brandywine Enduro Riders (BER) and the National Enduro Promotions Group (NEPG). The reclamation project, including the reconstruction of a portion of the ATV trail system, is contributing to increased economic and recreational opportunities and benefits northcentral Pennsylvania while improving the overall safety for users of the Whiskey Springs ATV trail.

The third and final objective of the project was to reduce AMD impacts upon both surface and groundwater discharges emanating from the project site. This was achieved through alkaline addition and other AMD source abatement/amelioration techniques including hydrologic controls and identification, and removal and/or special handling of acid forming materials. On-site AMD sources included discharges from abandoned underground mine workings, buried coal refuse with a very high sulfur content, and acidic unreclaimed surface mine SA. While it was clear that design elements of the Huling Branch AML Reclamation Project aimed at addressing AMD impacts would not completely eliminate those impacts, it was believed that incorporating these measures into the project reclamation plan would result in a long term reduction in pollution load and reduce the scope of AMD complexity of future AMD treatment and watershed restoration work. Similar previous Pennsylvania source abatement projects such as the Office of Surface Mining Reclamation and Enforcement's (OSMRE) 2012 National Award Winning Dents Run AML/AMD Ecosystem Restoration Project have produced the proof of concept for this approach. With respect to the Huling Branch AML Reclamation Project, post project monitoring results clearly indicated similar trends in pollution load reduction.

WESTERN REGION AWARD

MADRID LOW IMPACT STORMWATER PROJECT

Lloyd A. Moiola New Mexico Energy, Minerals and Natural Resources Department

While the New Mexico Abandoned Mine Land Program has worked extensively in the historic coal mining community of Madrid since the 1980s, in 2010 and 2011 the Program, its consultants, residents, local civic groups, and several agencies participated in a coordinated community planning effort to find comprehensive solutions to Madrid's legacy coal problems. One of the highest priority concerns identified by the community regarded issues arising from stormwater drainage off the gob piles and historic built environment. During intense storms, gob piles throughout the town produce significant sediment and runoff that impacts homes, businesses, roads and drainage structures. While the Program was developing context-sensitive low impact stormwater alternatives, an extreme storm event in 2013 caused severe flooding and gob erosion, washing coal gob and debris into local homes and businesses, particularly at the Mine Shaft Tavern and Museum Complex.

Working quickly, the AML Program completed an emergency project in October 2013 constructing temporary protection measures along properties at the base of the eroded gob piles and roads to protect homes and businesses from further damage.

Madrid is listed on the National Register of Historic Places and relies upon its historic character: particularly the visual aspects the mining landscape such as the gob piles and historic structures to attract tourism. Following the emergency project, extensive consultation and planning by AML compliance staff and its Contractors refined Low Impact Development (LID) based solutions that enabled construction of erosion control and stabilization measures during a twophased construction approach between 2014 and 2016.

This presentation will focus on low impact reclamation practices, planning, and cultural resource mitigation efforts that AML and its contractors used to alleviate the impacts of stormwater and sediment runoff in the Madrid Historic District while maintaining community and agency reclamation goals, and preserving Madrid's historic landscape.

APPALACHIAN REGION AWARD

BELL CENTRAL SCHOOL PROJECT

Carl B. Hays, Environmental Scientist - KY AML
Charles Booth, Environmental Scientist - KY AML

The project is located about three miles south of Pineville, KY. The project developed in response to a request for DAML assistance with a serious landslide that was undermining the school access road, parking area, sidewalks and facility illumination system.

The Division of Abandoned Mine Lands determined that the landslide and the related problems were linked to eligible, underground mining drainage. A comprehensive reclamation plan was designed and approved in the late spring of 2014.

A $2,132,348.00 contract was awarded to Jackson and Jackson Reclamation Services, INC. of Fall Rock, KY for the following: 1. Stabilization and reclamation of the aforementioned landslide. 2. Re-construction of the affected school access road, parking lot and sidewalks. 3. Total re-vegetation of the project disturbance.

Construction work began on August 20, 2014 and was successfully completed on August 10, 2015. The goals and objectives of the project were fully met. The landslide was abated in a timely manner and all work was completed, under budget, for a total cost of $1,922,416.18.

The Jackson and Jackson contractors produced excellent results from start to finish, with no disruption to the school programs or to their extra-curricular activities and sporting events. It was an honor and a privilege to work closely with Mr. Jackson and his fine construction crew throughout the life of the Bell Central School HP Reclamation Project. The inspector is very grateful for the unwavering support and technical assistance from our DAML construction specialists, engineers and management personnel. When it was all said and done, it was the combined, cooperative efforts of the contractor and the DAML project management team that resulted in a noteworthy success story at the Bell Central School.

MID-CONTINENT REGION AWARD

THE SUGAR RIDGE FISH AND WILDLIFE AREA 2 - INDIANA AML SITE 2083

Christopher J. Hostetler, P.E. - Chief Engineer Indiana AML DNR
Kit Turpin - Project Manager Supervisor Indiana AML DNR

The Sugar Ridge Fish & Wildlife Area 2 project was selected for the Mid-Continent Region Award as it reclaimed significant safety and environmental problems, employed innovative use of technology and effective geomorphic design, contained special considerations, and benefited the community. The project included the elimination of a 3,500 foot long, 25-35 foot high, dangerous highwall, almost 45,000 cubic yards of coarse refuse, acid mine drainage, an acid pit, and hazardous structures. The project included the innovative use of technology for the bathymetric survey of the abandoned mine pit bottom. It also utilized effective geomorphic design for the earthwork. The disposal of the coarse refuse into the bottom of the abandoned mine pit provided on-site construction difficulty as the pit was continuously receiving water from another abandoned mine pit 3,800 feet away via an abandoned underground mine. Special and unique considerations included a construction in a floodway permit from the INDNR Division of Water for having 1.4 square miles of drainage area and the coordination with State Fish & Wildlife non-game personnel to relocate Eastern box turtles. The project eliminated the safety and environmental problems while providing enhanced recreational and agricultural opportunities for citizens. This project increased public awareness of the Surface Mining Control and Reclamation Act (SMCRA) and exceeded the spirit and intent of SMCRA for its wide public impact and multitude of issues solved.

SMALL PROJECT AWARD

HURRICANE FORK GOB PILE PROJECT

Lesa Baker, Virginia Department of Mines, Minerals and Energy

The single, worst, mine related impact in an entire southwest Virginia watershed is no more. The innovation of a high-tech power plant, the commitment of a company and the creative use of the AML enhancement rule led to an historic environmental improvement to the uniquely biodiverse Clinch River. A stream was delisted, over 10 acres of gob removed and, most importantly, the threat to human health and safety was erased with reclamation. Over three hundred elementary students from Russell County schools added the final reclamation touches on April 27 by planting 1500 native hardwood seedlings on the reclamation project.

The difficulty for this project was maintaining the commitment until necessary partners were secured. The DMME funding of $420,000 is viewed as the agency's best investment of AML funds to eliminate mining related impacts and improve environmental quality in the Clinch River watershed. As the gob pile is completely removed, the landscape returns to its natural state and conforms to the original contours. In addition to the environmental benefits, the project also supported twenty jobs for a two- year period.

Hurricane Fork is the largest tributary to Dumps Creek, which flows into Clinch River at Carbo. The Virginia Department of Environmental Quality (DEQ) had included Dumps Creek on the state's list of 303d impaired streams, meaning the water quality did not support a healthy community of benthic species. As part of the Total Maximum Daily Load for Dumps Creek, DEQ prepared an Implementation Plan for the Dumps Creek watershed describing needed actions to accomplish for water quality improvement and eventually delist, i.e., remove Dumps Creek from the 303d list. DMME conservatively estimated over 100 tons of sediment eroded each year from the Hurricane Fork pile.

Dumps Creek is a tributary to the Clinch River, the largest stream in the coalfields of southwest Virginia. Today, the river is nationally known as a biodiversity hotspot. The Clinch contains the nation's greatest concentration of rare and imperiled freshwater animals. Supporting up to 46 species, at least 24 of which are in danger of extinction, the Clinch River is habitat to rare mussels, colorful minnows and darters, and excellent sport fish. At a river location just downstream of the Virginia Tennessee state line, the Clinch boasts the greatest diversity of freshwater mussels of any stream on earth. The Nature Conservancy has listed the Clinch River as the number one hotspot for threatened biodiversity.

HARD ROCK AWARD FOR CONTAMINATION HAZARDS

AKRON MINE AND MILL RECLAMATION PROJECT – NORTH PILE

Jason Willis – Mine Restoration Project Manager, TROUT UNLIMITED

Large scale abandoned mine land reclamation was completed at the Akron Mine and Mill site (Site) near the town of White Pine, Colorado during the 2015 and 2016 construction seasons. The site is located at the headwaters of Tomichi Creek, which is tributary to the Gunnison River in the Grand Mesa, Uncompahgre, and Gunnison (GMUG) National Forests. This discussion will focus on north pile actions where Trout Unlimited worked with federal, state, and private partners to complete a non-time critical removal action. Efforts focused on relocating and consolidating 127,000 cubic yards (CY) of contaminated mine tailings and waste rock containing high levels of lead and other heavy metals. These tailings and waste material reached heights of 50 ft. and abutted Tomichi Creek for long stretches of 1,100 ft., thus historically confining the drainage without an accessible floodplain. Two large repositories were created to house 40,000 CY of tailings/waste, while the remaining 87,000 CY was consolidated and capped with two feet of clean fill at re-contoured slopes of 4.5:1 out of the floodplain. This action then allowed for the creation of an accessible floodplain with widths ranging from 60 to 80 ft. based on historic 100- 500 yr. flood return periods. On-site woody material, rock, and over 150 willow bulb transplants were then used to stabilize the newly created floodplain, while a hummocking technique was also performed to stimulate plant and seed growth across the site.

HARD ROCK AWARD FOR PHYSICAL SAFETY HAZARDS

BUCKINGHAM PARK MINE CLOSURE

Erica Crosby, Colorado Division of Reclamation, Mining and Safety

Abandoned mines pose safety and liability issues throughout Colorado. Colorado's rich mining history left more than 23,000 old mines scattered across the State. The Buckingham Park Mine Closure Project includes twenty-seven (27) hazardous mine openings located in Boulder County, Colorado. The mine features are located in drainages along James Creek, Fourmile Creek, Lefthand Creek and Sherwood Drive. These sites are abandoned hard rock gold and silver mines that operated predominantly between the 1890s and the early 1900s. Many of the features are in close proximity to private residences, and nearly half of the sites are in close proximately to Buckingham Park and designated camp sites that are heavily used by recreational tourist. The Division of Reclamation, Mining and Safety (DRMS), working in conjunction with the U.S. Office of Surface Mining, the United States Forest Services and Boulder County Open Space, safeguard the entrances of hazardous inactive and/or abandoned mine openings using grates, bat grates and backfill.

DRMS utilized Colorado Correctional Industries (CCI) as the general contractor for the Buckingham Park Project. Since 1977, CCI (a division of the Colorado Department of Corrections) has worked to improve the lives of incarcerated men and women, reduce the tax burden of Colorado citizens and assist the CDOC in addressing the safety and well-being of citizens, victims, staff and offenders. The opportunities for self-improvement and meaningful work skills provided by CCI for incarcerated offenders help prepare these individuals for returning to free society.

The Buckingham Park Project required a CCI crew that consisted of eighteen (18) offenders and two (2) supervisors. The crew were able to camp for many nights near the project site before returning back to prison. Most of the sites were difficult to reach and required hand labor. Two of the mine sites required the CCI crew to fabricate a make-shift bridge to cross James Creek. The remoteness of such projects tends to only leave a handful of contractors willing to do the work, potentially increasing the cost of the project. Project partners, including the USFS and Boulder County Open Space, also contributed greatly to the project resulting in significant savings of OSM dollars, which in turn can be applied to other safeguarding projects in Colorado.

TECHNICAL ABSTRACTS

CLOSING IN ON THE HOLY GRAIL
BENEFICIAL USE OF HARD ROCK WASTE AS A SOURCE FOR BIOMINERAL FERTILIZERS

Reclamation/Safeguarding/Project Implementation – Beneficial use of Waste Materials & CCB use at AML Sites

Andrew Harley, Duraroot Environmental Consulting

The large volumes of waste produced at mining operations are expensive to manage, and frequently cited as an obstacle in the environmental sustainability of mining. The majority of waste produced is still placed into storage facilities, and the reclamation and long-term management of these facilities has become an important part of modern mine development and mine closure.

Over the past few years, the applications of certain microorganisms have gained importance in the field of applied environmental microbiology. Amongst them, biomineral processing of metal mining from ores, concentrates, industrial wastes, overburdens with microorganisms and/or their metabolites. This process still produces waste material requiring management.

This paper describes a novel technique that combines the extraction of metals from mine waste using environmentally safe chemistry, followed by biodigestion of secondary waste from this process to generate an additional commodity. This process results in a zero-waste facility and multiple revenue streams. Bench-scale and pilot test data will be presented, as well as a description of projects currently being permitted.

BIOLOGICAL ASSESSMENT OF THE OHIO ABANDONED MINE LAND PROGRAM

Kaabe Shaw, Ohio - DNR Division of Mineral Resources Management Abandoned Mine Land Program

Federal Abandoned Mine Land (AML) funds established by The Surface Mining Control and Reclamation Act (SMCRA) are administered by the Ohio Department of Natural Resources (ODNR) Division of Mineral Resources Management (DMRM) AML program to address the highest priority problems in Ohio associated with historic coal mining. The National Environmental Policy Act (NEPA) requires agencies who receive federal funding to conduct an environmental review process before taking actions that could have environmental effects. The environmental review process includes compliance with section 7 of the Endangered Species Act (ESA). Challenges exist in complying with the ESA while still completing projects within an acceptable timeframe. The most significant challenge is the stringent tree clearing restrictions that are a result of the listing of the Indiana Bat (IBAT) and Northern Long-Eared Bat (NLEB). Construction schedules often do not coincide with the clearing window that allows DMRM to avoid potentially adversely affecting the IBAT and NLEB. In order to meet the goals of the AML program while minimizing adverse effects to threatened and endangered species, ODNR DMRM submitted a Biological Assessment of the Ohio AML Program to the U.S. Fish and Wildlife Service (USFWS). A geographic information system (GIS) based analysis was conducted to evaluate historical effects of the AML program's activities to suitable IBAT/NLEB habitat. The results of this analysis were used to estimate the impacts of future AML projects to IBAT/NLEB habitat. By providing this assessment to USFWS, an incidental take permit will be issued for AML project activities in Ohio which will allow DMRM maximum flexibility in bidding and constructing AML reclamation projects.

MICROBIALLY SELF-SELECTING WETLANDS IN A BOX – BIOLOGICAL WATER TREATMENT SYSTEM

Colin Lennox, Biomining Products

MRU's (metal removal units) are microbially self-selecting wetlands in a box used to oxidize or reduce mine drainage impacts. As a corollary to the bioleachate process, the materials precipitating within the MRUs are separated by their RedOx potential. This means that a host of unique environments can be engendered to remove difficult and valuable resources such as schwertmannite (formed naturally in low pH conditions) and manganese oxide. Due to the high biological density of the MRU's their requisite site footprint is generally about 1/100th the scale for the same treatment.

MRUs can also be used for agricultural water and nutrient recycling and a host of reductive metabolic pathways including methane genesis, hydrogen sulfide or selenium reduction.

MARYLAND COAL MINING HERITAGE: GREEN GLADES AND SOOTY GOB PILES

A Preservation Guide to the Management of Historical Resources Of the Coal Region of Maryland

Constance Lyons Loucks, Environmental Program Manager
Maryland Department of the Environment Mining Program – Abandoned Mine Land Division

In the 1980's, after the passage of the Surface Mine Control and Reclamation Act of 1977, newly formed state abandoned mine lands programs were tasked with completing program development studies that would inventory, describe and protect environmental and cultural resources at potential risk during abandoned coal mine reclamation projects. Research assessment field studies were carried out by professional historians and archeologists to inventory, document and organize essential data and information on historic standing structures, prehistoric archeological resources, and historic archeological structures in the coal region of western Maryland. This presentation will describe Maryland's experience to develop a unique methodology to rank and document in detail the vast landscape of the State's Coal Mining Heritage.

A detailed but abbreviated comprehensive documentation method was developed to evaluate each potential historic structure based on a combined ranking score of known architectural integrity, architectural significance, and historical significance. Beginning in 1980, five historians spent four years visiting every site over 50 years old in the coal region, filling out multiple forms, detailing important descriptive and historical information along with color slides and standard black and white photographs. All this information was compiled and preserved by site in individual files that were available at the Maryland Abandoned Mine Lands Office and at the Maryland Historical Trust (MHT) in Annapolis, Maryland. By 1990, the lead historian, Donna M. Ware, took the mountain of important historical data and summarized it in an MHT published book entitled Green Glades and Sooty Gob Piles. This comprehensive guide provided access to detailed information that was and continues to be an invaluable aid for cultural and environmental resource managers. With the advent of the computer age, the Maryland Historical Trust funded an online resource that included access to the results of the entire survey.

MICROPILE OVERVIEW AND APPLICATIONS

Justin Anderson, P.E., Project Development Engineer
Paul Travis, E.I.T., P.L.S., Senior Project Development Engineer

This presentation will provide an introduction to micropiles and a brief history of the development of the technology. An overview of current design guidance as well as installation methods in various geologies and terrain will be provided. Cases studies illustrating the use of micropiles for underpinning, karst foundations, temporary shoring and landslide repair applications will be provided.

BRIDGING SOFT SOILS AND VOIDS WHEN RECLAIMING ABANDONED QUARRIES

Eric Michiels, PE, Global Director- Mining, Maccaferri Mining Solutions
Nicola Brusa, Technical Director for Maccaferri UK

Quarrying often occurs in urban areas, leaving abandon mines an eyesore and at a minimum a dangerous site. These mines are often left as massive holes in the ground or cuts into mountainsides. Falling debris is often a significant threat as is falling from a vertical highwall or drowning in a pool of water that has developed. Reclaiming of abandon quarries presents an opportunity for development of commercial, residential and recreational activities, but first one must address these ever present threats. Many developers are looking to fill in these areas. Structural fill is often expensive and often times less care is employed when installing organic or other materials. This backfilling practice often creates voids in the backfill making the material susceptible to settlement. In the United Kingdom, developers have twice called on Ultra High Strength geogrids to bridge the voids beneath a subdivision built on an abandon quarry. Another developer in Turkey is also employing the same solution beneath 600,000 sq meters of development. Ultra High Strength geogrids present tensile strengths up to 1500 kN/m, or 50-100 times more than traditional geogrids. These geogrids have been used in the US to bridge sinkholes on highways and transfer the loads in pile caps. This technology may offer a cost effective way to bring closure to some of the abandon mines in the United States.

UNITING ECONOMIC DEVELOPMENT AND RECLAMATION IN SOUTHWEST VIRGINIA

Adam Wells, New Economy Program Manager, Appalachian Voices

Repurposing abandoned mine lands for economic projects like industrial site development, solar facilities, outdoor recreation, and sustainable agriculture are project examples that are supported by local government leaders and citizens in southwest Virginia and beyond. Adam Wells is an eighth generation Wise County, Virginia resident and Appalachian Voices' New Economy Program Manager. Mr. Wells will share the lessons learned from the 2016 study on "Innovative Mine Reclamation." In partnership with engineering and economic analysis consultants, Appalachian Voices analyzed AML sites in far Southwest Virginia for economic development potential. The goal was to identify specific AML sites eligible for RECLAIM Act or other federal funding for remediation and development that can provide an economic benefit to the surrounding community. The approach considered innovative and outside-the-box strategies and extensive input from local and regional government officials. Scenarios and planning specifications included a solar farm on a reclaimed mine site powering a high-tech data center; a permaculture food production systems with a closed waste loop; and a town park replacing a dilapidated and abandoned coal processing facility. Appalachian Voices, along with universities, local government leaders, philanthropy, and community organizations, continue to facilitate opportunities for residents to become more engaged in sharing ideas and making decisions about their economic future. They've facilitated community visioning forums and collaborated with the higher education institutions and economic development agencies on annual "Economic Forums," that attract hundreds of citizens, economic development experts, and others. Through these and other efforts, community based organizations demonstrate the potential to link local and regional leaders input on AML projects with state programs and the AML Pilot, as well as the need for visioning and site-specific scenario planning with an economic impact 'lens.'

HOW AML & PILOT FUNDS CAN LEVERAGE PRIVATE PHILANTHROPY ON ECONOMIC TRANSITION EFFORTS

Stephanie Randolph, Program & Grants Officer, Blue Moon Fund

Philanthropies and foundations in Appalachia co-fund economic and community development projects; leverage private & public dollars; build capacity and connect local & regional leaders; and support strategies that diversify coal-impacted communities in transition, often referred to as the Just Transition. When projects align with economic recovery goals, philanthropic organizations and foundations can help AML programs in Appalachia by contributing pre- or post-reclamation and restoration funding. In 2017 the Just Transition Fund was included in a $3 million initiative by Bloomberg Philanthropies. With this new support, the Just Transition Fund and other funders can help scale innovative solutions to create jobs and new businesses, train workers, and replace lost tax revenue. This session will highlight the areas of potential overlap 2 for AML programs with philanthropy and economic diversification in central Appalachia. Stephanie Randolph, Program & Grants Officer with the blue moon fund, will share examples of promising practices and other resources from the region. Additionally, Ms. Randolph will discuss the potential to align grants and impact investing activity, which increasingly encourages investment from foundations and may also bring financial returns.

BUILDING THE RESTORATION ECONOMY AND A GENERATION OF RECLAMATION LEADERS

Joey Ruerhwein, Director of Partnerships, Stewards Individual Placement Program

Yolande Norman, Chief, Reclamation Support Division, Office of Surface Mining Reclamation and Enforcement

AmeriCorps members are placed with organizations working to mitigate the long term impacts of pre-regulatory mining on the economy and the ecology in Appalachian coal country and in Western hard rock mining areas. Stewards launched as the individual placement program of Conservation Legacy. Stewards operates both VISTA and AmeriCorps Members, which 3 spearhead several initiatives including OSMRE/VISTA, OSMRE AmeriCorps, DOI/VISTA, and TCU/VISTA, successfully placing over 600 AmeriCorps State and National and VISTA members across the U.S. and territories. We strive to create a better future for people and for the environment by supporting and investing in the next generation of leaders. These programs leverage the AmeriCorps VISTA program to bring multifaceted approach to engaging youth, alleviating poverty, and addressing environmental issues on AML.

AML INNOVATIONS AND STATE-LOCAL PARTNERSHIPS IN SOUTHWESTERN VIRGINIA

Fred L. Ramey, Jr., City Manager, City of Norton VA
Lesa C. Baker, Interim AML Project Coordinator - VA DMME

The City of Norton has a population of 3,958, making it the least populous city in Virginia, along with the westernmost city in the state. However, Norton is 'on the map' for many other exciting reasons. The city has invested heavily in recent years to enhance its infrastructure and other assets so that the city and region are known destinations for outdoor recreation and the burgeoning eco-tourism industry. When a tall embankment behind a busy street and sidewalk became unstable, the city built five terraced walls and freestanding walls to secure the steep slope. The City of Norton, the Virginia Department of Transportation (VDOT), and the Virginia Department of Mines, Minerals & Energy (DMME) partnered to make this a safe, successful, and attractive project that welcomes residents and visitors to the city. In addition to stabilizing the slope and improving an area of abandoned mine land (AML), the project also provides a safe pedestrian connection between Norton Elementary & Middle School and Downtown Norton. The Norton River Walk is an ongoing project with a final vision of a park and a greenway trail to be built around and through an abandoned coal processing facility along the Guest River within the city limits. This session will highlight local-state partnerships on AML projects and the potential for AML project sites to be leveraged in economic transition efforts. Fred Ramey has served as the Norton City Manager since April 2012, and has been employed by the city since 1988. Fred holds a B.S. in Business Administration from the University of Virginia – Wise and a Masters of City/Public Management from East Tennessee State University.

KEEPING A GOOD THING GOING – 20 YEARS OF RURAL ACTION, AMERICORPS, AND MORE!

Marissa Lautzenheiser, Watershed Coordinator, Rural Action

Restoration can be part of an overall portfolio of economic transition when it is connected to marketbased opportunities like local, authentic tourism (sometimes called eco-tourism). Restoration makes it possible to have natural assets worth building tourism opportunities around. The eco-tourism industry is just beginning to build in parts of rural Appalachia, and community organizations, like Rural Action in Ohio, and AmeriCorps members, are key to helping build that momentum. Southeast Ohio contributes only 4% to the overall state tourism economy, but because of the relative size of its economy, it has a significant local impact. Southeast and Appalachian Ohio have the largest outdoor recreation areas, including Ohio's only national forest and numerous state parks and state forests. Rural Action, a regional, member-based nonprofit, annually facilitates the placement of twenty-six AmeriCorps members that work on eco-tourism and AMD restoration projects. The AmeriCorps members are part of the 8th year of the Ohio Stream Restore Corp, an initiative to restore watersheds, improve natural assets through trails and clean ups, provide environmental education, and promote a regional development and tourism strategy built on these assets across the coal mining region of Appalachian Ohio. At the end of each service year, AmeriCorps members leave behind improved, more visible, and cleaner natural sites on public and private lands, stronger partnerships, environmental education connecting students and communities to these assets, and volunteers engaged throughout it all. AmeriCorps members leveraged an additional 6500 volunteer hours and over $100K for regional renewal. This panel shares Rural Action's perspective on challenges and opportunities to developing eco-tourism with multiple stakeholders and how to leverage AmeriCorps members for restoration projects.

COMING TO A CONSENSUS: COLLECTIVE IMPACT FOR MEANINGFUL WATERSHED MANAGEMENT

Marissa Lautzenheiser, Middle Tuscarawas River Watershed Coordinator, Michelle Decker, CEO

Rural Action is a sustainable development non-profit organization that performs and promotes a variety of community based projects and efforts including watershed restoration and preservation. Since 1994, we have been a leader in stream restoration throughout Ohio's coal region, coordinating and working on restoration projects in numerous watersheds spanning twelve counties in eastern and southeastern Ohio. Historically, the majority of this work has targeted abandoned mineland reclamation and acid mine drainage treatment.

Beginning in 2014, Rural Action coordinated a strategic planning initiative with numerous stakeholders with the goals of identifying the challenges to developing and implementing a regional watershed restoration strategy and developing a new watershed management model for the Ohio River Watershed in eastern and southeastern Ohio. Concluding in 2016, the planning initiative provided great insight into the challenges and complexities of watershed management, including sustainable funding and organizational collaboration and capacity, among others.

One of the conclusions drawn from the planning process was that a successful, long-term watershed restoration model for Ohio's coal region must be based on the concept of "collective impact," the concept that real change occurs when partners agree on shared goals, and chart a way forward. As a result, the Appalachian Ohio Watershed Council (AOWC) was created, facilitated by Rural Action. The AOWC includes a diverse set of stakeholders and partners representing nonprofits, local governments, state and federal agencies, and businesses and industries.

The presentation will include a summary of the completed strategic planning initiative and a discussion of the collective impact process undertaken, including examples of the goals, objectives and strategies identified to date. Time will be allotted for questions and answers.

NATURE BASED BUSINESSES, RESTORATION, AND THE ECONOMY

Beth Wheatley, Director of Government Relations, The Nature Conservancy

The Nature Conservancy will share their strategies for land and water conservation, ecological restoration, and nature-based businesses on economic development. The national non-profit organization has directed mitigation and other funding towards the reclamation of abandoned mined lands in southwestern Virginia to help to restore forests and water quality. TNC is also partnering with local coalfield communities to connect its conservation work with economic revitalization strategies that involve outdoor recreation and tourism. In partnership with private developers, state organizations, local leaders, and partner organizations TNC seeks to convene stakeholders for shared analysis and shared goals on reclaimed and pre-law lands. Their research and partnerships demonstrate that the possibilities are unique to each landscape, but with some creativity, collaboration, and planning, restoration and reclamation activities can be expanded to create even more economic and community benefit.

HOW IMPACT INVESTMENTS CAN ADDRESS THE AML PROBLEM

Kuni Chen, Director / NatureVest, The Nature Conservancy

There is a growing need to protect ecosystems and the resources that they provide. At the same time, there is insufficient public and philanthropic funding for conservation. Recognizing the need to close this funding gap, The Nature Conservancy created NatureVest, its conservation investing unit focused on developing conservation investment opportunities for private capital. As impact investing is on the rise, Kuni Chen will explain how impact investing deals can be created in coordination with AML sites and reclamation efforts nationwide. Some of Kuni's work includes mine methane carbon offsets, solar on abandoned mine lands, and acid mine drainage restoration.

SMCRA TITLE IV FEE REAUTHORIZATION: COMMUNITY OUTREACH EFFORTS

Anne Daymut Western Pennsylvania Coalition for Abandoned Mine Reclamation

With the end of the current SMCRA Title IV fee collection slated for 2021, the non-profit community in Pennsylvania has been gearing up for re-authorization efforts. NGOs working on AMD/AML issues in Pennsylvania have a long history of working cooperatively with government and industry for environmental improvement. Our current campaign to reauthorize SMCRA's Title IV fee collection is one example of how our partnerships will work for the common good.

The Western Pennsylvania Coalition for Abandoned Mine Reclamation is a member of the Pennsylvania AML Campaign, a coalition of Pennsylvania environmental organizations working to secure re-authorization. WPCAMR will share techniques for past and present SMCRA Title IV re-authorization outreach. WPCAMR showcased an AML Campaign Toolkit including a website, commercial and paper publications at the 2016 NAAMLP Conference. For the 2017 NAAMLP Conference, WPCAMR would like to debut a longer-length film to accompany the AML Campaign Toolkit. In addition, WPCAMR will present ideas for developing cooperative partnerships between your governmental agency and citizen's groups based on surveys and interviews of individuals and organizations involved in PA's successful watershed movement over the past two decades.

OLD BEVIER PASSIVE TREATMENT SYSTEM – PERFORMANCE AND RECONSTRUCTION PLANS

Daniel Wedemeyer, Environmental Specialist III, Missouri Department of Natural Resources
Paul T. Behum, PhD. Sr. Hydrologist, Office of Surface Mining Reclamation and Enforcement

The Old Bevier Passive Treatment System is an abandoned mine land (AML) reclamation project located in Macon County, approximately 50 miles north of Columbia, Missouri. The treatment system was constructed by the Missouri Department of Natural Resources-Land Reclamation Program (MDNR-LRP) with assistance from the Office of Surface Mining Reclamation and Enforcement, Mid-Continent Region (OSMRE-MCR). This treatment system employs a network of French drains to collect underground acid mine drainage (AMD) and transport it to the passive treatment system. The original treatment system was constructed in 1990 and required a large amount of alkaline-dilution water to produce a net-alkaline discharge. Operational difficulties with the relatively distant dilution water source limited the effectiveness of the original system. A major reconstruction effort of the system was completed in 2001. The enhanced 2001 treatment facility consists of two vertical flow ponds in conjunction with two oxidation ponds and three wetlands. The enhanced passive treatment system has been successful in removing the majority of the iron and acidity from the AMD. An average of 98.5% of the iron has been removed by the 16-year old passive system; however, the rate of flow though the vertical flow ponds has diminished, the discharge pH has declined, and there is a considerable accumulation of iron hydroxide sludge that requires removal. We will discuss the water quality trends and functionality of the enhanced Old Bevier Passive Treatment System, and the ongoing plans to rehabilitate the system again, as well as the future outlook for passive treatment systems in general in Missouri.

STACKHOUSE PARK AML RECLAMATION PROJECT CONSTRUCTION, USE, ABANDONMENT & RECLAMATION OF THE ELK RUN SHAFT

Eugene C. Trio, Mining Engineer - PA DEP-BAMR
Arthur A. Crossman, Geologic Specialist - PA DEP-BAMR

The Pennsylvania Department of Environmental Protection (DEP), Bureau of Abandoned Mine Reclamation's (BAMR) Project, OSM 11(1052) 101.1, Stackhouse Park, is located in Westmont Borough, Cambria County, Pennsylvania. Stackhouse Park, where the project gets it name, is a public nature park that covers 227 acres. The park was a gift to the City of Johnstown from The Cambria Iron Company in 1931.

Beneath the grounds of Stackhouse Park, lies the Rolling Mill and Rosedale Mines. The Elk Run Shaft extended through the Rolling Mill Mine and down to the Rosedale mine providing a haulage way through the Rosedale mine to transport coal from the Rolling Mill Mine to the Rosedale Coke Plant. The haulage method was considered state of the art at the time and was featured in a 1921 article in Coal Age Magazine.

The Elk Run Shaft was 12 feet in diameter and 350 feet in depth. Although the top of the shaft, when abandoned in 1931, was screened, it became an attractive nuisance for many of the park's visitors. Later efforts to prevent access included reinforcement to the screen and fencing. As time passed the cap and collar deteriorated and visitors to the park found their way through the fencing and gained access to the shaft. This shaft was not only a fall hazard, but also hazardous because of poisonous gasses emanating from the mine through the shaft.

This presentation will explore how the shaft was constructed and its "state of the art" use during mining operations. It will then cover the history and production of the Rolling Mill and Rosedale Mines, including the devastating 1902 explosion in the Rolling Mill Mine. Also covered are the reclamation challenges BAMR faced during the development, design, and construction of the reclamation project. And finally it will show the partnering work done by the Johnstown Heritage Association and others to commemorate the historical significance and heritage of the Elk Run Shaft.

HIGH MOBILITY GROUTING FOR SUBSIDENCE MITIGATION AT GLENROCK, WYOMING

Dr. Mohamed Gamal, P.E. Principal Engineer - Brierley Associates
David S. Hallman, P.E., P.G. Principal Geological Engineer - Brierley Associates
Dave Hibbard, GIT Senior Geologist - Brierley Associates
Melissa Bautz, P.G. Wyoming Department of Environmental Quality Abandoned Mine Lands Division

Through initial reconnaissance work and subsequent geotechnical investigations of a sinkhole event in May 2016, previously unknown mine workings were discovered at very shallow depth underneath primary roadways at the intersection of Millar Lane and the I-25 Bypass (aka Highway 20-26-87 and E. Birch Street) in Glenrock, Wyoming. In several locations mine voids were discovered as shallow as 10 feet below ground surface. As a result of the past history of subsidence events in Glenrock, previous subsidence mitigation efforts had been conducted in the area, in multiple projects and phases, but predominantly east of the area where the sinkhole occurred and new mine workings discovered.

In order to mitigate the subsidence risk to the critical roadways while maintaining use for local traffic, a void-fill grouting program was implemented. The extremely shallow depth to the mine workings encountered at Millar Lane limited grout injection pressures, and required careful grouting and grout monitoring procedures to prevent damage to the roadways. Additionally, the shallow depth to the mine workings required a high degree of void filling to mitigate the subsidence risk. The ability to achieve a high degree of void filling was also complicated by the highly caved and rubblized conditions present, water-filled mine workings, soft sediment infilling, and also by previous grout and sand slurry injection as operations moved eastward. As a result, injection of high-mobility grout with good flow characteristics and penetration capabilities was necessary for the conditions present.

Verification core drilling conducted during initial stages of pilot grouting and again after all grouting was completed indicate that the high mobility grout was effective at filling both large open voids as well as small cracks and fissures, and that a high degree of void filling was achieved. These results confirmed the effectiveness of the high mobility grouting approach.

MINE FIRE EXTINGUISHMENT

David S. Hallman, P.E., P.G. Principal Geological Engineer Brierley Associates

In order to extinguish a mine fire it is necessary to prevent the so-called fire triangle; heat, fuel, and oxygen combination from occurring. One or more of these three components must be removed or eliminated by some means in order to extinguish a fire. The current methods and techniques that are in general use throughout the world to achieve this and extinguish coal mine fires includes:
Excavation - Isolation - Inundation with water - Surface seals - Noncombustible barriers
Underground sealing with stoppings or bulkheads - Grouting - Hydraulic backfilling or 'flushing'
Pneumatic stowing - Steam or water mist - Dynamic pressure balancing, ventilation control
Inertization through Nitrogen or Carbon Dioxide gas injection - Cryogenic injection
High-expansion foam - Injection of hydrogel - Foamed gel

The US Department of Interior Bureau of Mines conducted mine fire research and control efforts from 1910 up until 1996 when it was closed by Congress. After 1949 when it began documenting fire-control projects, extinguishment methods and costs, the Bureau of Mines performed control or extinguishment efforts on approximately 347 mine fires. The detailed documentation of the Bureau of Mines fire control efforts that is available provides useful reference for instances or situations in which these various mine fire abatement techniques have been successful. Equally as important, these reports also provide detailed description of the reasons or cause for failure in situations and conditions for which many of these techniques were unsuccessful.

This presentation provides a summary and discussion of the relative effectiveness of the Bureau of Mines and more recent mine fire control methods. Review of these results provides useful information that should be considered when evaluating potential mine fire abatement strategies. This is particularly true with respect to situations or instances in which the various methods have generally been unsuccessful in order to avoid repeating past mistakes.

FOAMED BACKFILL FOR SUBSIDENCE MITIGATION AND COMBATING MINE FIRES

David S. Hallman, P.E., P.G. Principal Geological Engineer Brierley Associates
Melissa Bautz, P.G. Wyoming Department of Environmental Quality Abandoned Mine Lands Division

Backfilling of abandoned mine workings for subsidence mitigation and combating mine fires is nearly as old as mining itself. Common backfill methods that have been employed in such instances include hydraulic flushing, pneumatic injection, grouting, paste, foam, gel and foaming gel. Borrowing on technology developed for solids transport in pipelines and more recently fracking, engineered mixtures of foam and solids can be used to create a slurry for placing backfill material in mine workings and rubble (gob or goaf).

The foam slurry approach allows backfill to be placed much more effectively and at significantly reduced cost relative to other traditional approaches; including hydraulic flushing, pneumatic stowing, or grouting. Cost advantages of the foam slurry flushing approach include the ability to use a wide range of low-cost noncombustible materials derived from on-site sources or waste from other industries, low water consumption, and wider borehole spacing.

Other benefits of the foam slurry approach include:
- No expensive cementitious binder is required
- Very little water is used
- Foam can be easily adjusted to control the viscosity or slump of the mixture
- The foam can be engineered to control placement of the noncombustible solids
- High velocity turbulent flow is not required to maintain the solids in suspension
- Foam slurry readily flows and deposits solids into nooks and crevices and other dead end areas; and
- Aggregate size can be adjusted to suit the ground conditions present;
  open or collapsed, large or small voids, water or air-filled, etc.

This presentation presents the successful results of a pilot inject project using foamed slurry to place backfill in abandoned coal mine workings at Glenrock, Wyoming.

ADVANCEMENTS IN IDENTIFYING SUBSURFACE ABANDONED MINE VOIDS

Integration of Historic Data, Multi-Method Surface Seismic and Borehole Imaging for Remediation, Wyoming

Jim Hild, PG Geophysics Manager-Principal Geophysicist, Fugro USA Land, Inc.

2D profile seismic data and 3D Square Array Void Mapping (SAVM) seismic data were acquired at dozens of sites in the Powder River Basin of Wyoming in support of the Abandoned Mine Lands (AML) program. Many towns and critical structures in Wyoming are extensively undermined by abandoned shallow (<200 ft bgs) mine workings up to 100+ years old which pose ongoing risks. Over time these abandoned mines can progressively collapse, causing subsidence-related surface deformation that can affect buildings, infrastructure, public safety and property values. Void conditions vary from open air-filled to water-filled to completely collapsed and rubble-filled. Additional hazards may be present, such as pressurized combustible gases and active mine fires, which complicate intrusive investigations and remediation efforts. Integration of 2D IMASW Vs and 2D finite-frequency first-arrival Vp tomography, seismic reflection, group velocity, relative amplitude processing and backscatter analysis delineates voids and collapse zones at depths up to ~180 feet. A custom, modular, integrated acquisition design combined with multiple processing approaches can adapt to a range of subsurface conditions often poorly constrained prior to seismic data acquisition. The integration of 4 to 5 processing techniques is often required to identify voids based on multiple co-located geophysical anomalies. Initial seismic surveys are targeted based on historic mine maps and borings with variable location accuracies, LiDAR and satellite imagery, and geomorphic features. Geophysical anomalies are interpreted and ranked by number of co-located types in XYZ space to prioritize drilling targets. Subsurface investigations use various drilling methods, downhole geophysics, borehole sonar/laser and camera/video to image void spaces, providing data for geo-referencing historic mine maps, and assessing void volumes and mine conditions. This integrated approach is applicable to all shallow voids, e.g., karst.

I WORK IN ABANDONED MINE RECLAMATION - "HUH? WHAT THE HECK IS THAT?" MAKING ABANDONED MINE LAND RECLAMATION MORE OF A COMMUNITY ASSET

Michael C. Korb, P.E., Senior Mining Engineer, Tetra Tech, Inc., Pittsburgh PA and Heritage Consultant

A mine is only a temporary use of the land. The operation of a mine may last a few years or several decades, those not permitted since 1977 are abandoned mine lands (AML). Abandoned mine lands (AML) are reclaimed when they meet certain criteria and when the state or the public or the landowner works at having the project done, and the funding's available.

AML priorities have focused on reclamation of hazards. In both cases, mine sites are usually returned to their pre-mine uses, usually wildlife habitat or forestry, which often has low visibility and doesn't benefit communities.

Mine-closure plans and AML reclamation are seldom creative. While I was working in the state AML program, we did some "innovative" reclamation, but one department secretary described our role as "filling holes."

In recent years, regulators have looked kindlier on imaginative land uses for active mines, and AML projects have begun reclaiming the energy of communities affected by legacy coal mining. 1990 and 2006 SMCRA amendments created set-aside allowances for abandoned mine drainage treatment. The 2016 Federal Appropriations bill included a $90 million "pilot" project for economic development on AML (AMLER) in three states, and the 2017 bill increased that to $105 million to be used by six states.

The pilot program projects are a good start for making AML more of a community asset. Projects could and should include tourism, recreation, museums; industrial development, research or education centers; gardens, parks, fish farms, agriculture; and mine water district heating.

This presentation will look at and discuss some of the pilot projects in progress, some past projects here and in other countries, and will touch on some "out-of-the-box" ideas for making mine closure and AML projects more sustainable and more of a community asset.

USING FOAM AS A TRANSPORTATION MEDIUM FOR BACKFILLING UNDERGROUND VOIDS

Rich Palladino, President Organization: Aerix Industries

Underground voids are the result of historic mining, active mining, and some are naturally occurring. In the case of abandoned underground mine voids, surface subsidence can occur as the old mine workings collapse, resulting in potential property damage and dangerous surface openings. Usually, these voids and mine workings are inaccessible and backfilling work must be conducted remotely, through boreholes drilled from the surface, that provide a conduit for the backfill material.

Traditional remote backfilling methodologies include hydraulic backfilling, which requires large volumes of water to transport the material, and grouting, which incorporates portland cement and/or fly ash with sand, resulting in a strong, but costly void filler.

ARX-Transport™ technology was developed as a cost-effective alternative to traditional backfilling methods, by replacing the water, cement and fly ash, with pre-generated foam to transport the sand or other backfill material into open voids. The foam dissipates in 24 to 48 hours, leaving only the backfill material, which self-compacts. The foam can be engineered for greater or lesser persistence, depending on the dissipation requirements.

Learning objectives and topics to be discussed include:

1. Description of the technology and concept
2. Subsidence mitigation for AML applications
3. Gravity placement application without pumping
4. Placement application using pumping equipment
5. Underwater placement applications (inundated voids)
6. Potential for use in active mines for stope filling
7. Potential for transportation of mine tailings to tailings ponds
8. General and relative comparison of costs with other backfilling methods

AN INVESTIGATION OF TREE GROWTH AND WOODY VEGETATION COLONIZATION ON A 19 YEAR-OLD FORESTRY RECLAMATION SITE

Wesley Dement M.S. student, Forestry and Natural Resource Sciences University of Kentucky

Surface coal mining has disturbed more than one million acres of Appalachian forest. Reclamation employed in compliance with federal regulations often compacts substitute soil material (spoil) and inhibits tree growth. In 1996, University of Kentucky researchers established an experiment in eastern Kentucky to investigate the effects of spoil compaction on tree growth and survival and develop guidelines regarding site preparation and tree species compatible with mine reforestation. The study evaluated three spoil grading treatments: 1) no grading (loosedump); 2) graded with one equipment pass (strike-off); and 3) multi-pass grading resulting in uniform surface appearance (control). Treatments were planted with six native tree species. Nineteen growing seasons following planting, differences in survival and growth were compared among species and treatment and volunteer woody vegetation was inventoried. Survival ranged from 3.8% for black walnut in compacted spoil to 87.14% for white ash in uncompacted spoil. Analysis of tree height data revealed significantly larger mean overstory heights for all species in strike-off and loose-dump versus the control treatment with the exception of black walnut. Mean overstory heights were not significantly different between strike-off and loose-dump treatments. Both strike-off and loose-dump treatments exhibited significantly more volunteer stems that the control. Long-term data indicate the benefit of low compaction grading for reforestation of Appalachian surface mines. Data further suggest that strike-off sites may support tree survival and growth as well as loose-dump sites. Strike-off reforestation sites exhibit generally uniform topography that may facilitate efficient application of silvicultural treatments and timber harvesting, making this a promising treatment for Appalachia's surface mines.

WATER-QUALITY AND STREAMFLOW GAIN AND LOSS IN ABANDONED MINE AREAS OF THE DANIEL BOONE NATIONAL FOREST, KENTUCKY, 2015-2017

Mac A. Cherry, Hydrologist, U.S. Geological Survey Ohio-Kentucky-Indiana Water Science Center

During 2015-2017 the U.S. Geological Survey, in cooperation with the U.S. Forest Service, characterized streamflow gains and losses and water-quality in two study areas of the Daniel Boone National Forest affected by acid mine drainage (AMD). Synoptic streamflow surveys were made in the Cumberland River and Rock Creek watersheds. Synoptic streamflow surveys, which included discrete water-quality measurements, recorded streamflow at various sites in the watershed. Increases or decreases in streamflow at various sites defined gaining and losing reaches. It was likely that both karst features and anthropogenic underground mining portals created gaining and losing reaches in the study watersheds. Two streams in the Cumberland River watershed, Wildcat Branch and Addison Branch, had losing reaches influenced by a limestone formation. In the Rock Creek study watershed, an appreciable loss of surface water to groundwater was measured at the confluence of Rock Creek and White Oak Creek during both synoptic streamflow surveys. Values of pH and specific conductance indicated the water-quality in the Cumberland River watershed continues to be influenced by AMD. The circumneutral pH values and relatively low specific conductance values indicate previous remediation efforts in the Rock Creek watershed were still mitigating the effects of AMD during the study period. The results of the study will aid the U.S. Forest Service with their remediation efforts in the study watersheds.

THE FULL SCALE MECHANICS OF SURFICIAL SLOPE STABILIZATION

Bob Lyne, Geobrugg North America

Slope stabilization systems that use flexible facings in combination with grouted anchors have been widely used to stabilize steep soil and weathered rock slopes for more than a decade. These systems have proven to be a very cost-effective solution, and have seen widespread acceptance. The tools used to design these systems have been based on small scale modeling and testing of individual components. Empirical evidence has shown that these design models are providing solutions that are technically sound.

The absence of scientific, full scale testing, however, has prevented full validation of the design tools. An extensive series of tests has now been performed to provide an in-depth look at the full scale mechanics of slope stabilization. The test series was based on the use of a simulated slope consisting of a large scale box that could be tilted to simulate a full range of slope angles up to 85°. Multiple soil types where tested in conjunction with a variety of different flexible facing materials. Instrumentation on the test box provided load information, and laser scanning of the slope surface provided detailed data regarding deformations of the soil.

This paper will discuss how this full scale test series has provided validation of the system dimensioning concept and the importance of load transfer within the system. It will also introduce new types of mesh and spike plates that offer solutions for a broader range of slope conditions as well as more detailed cost optimization of system designs.

USA DRONE PORT AND UNMANNED ROBOTIC RESEARCH AND DEVELOPMENT CENTER

Bart Massey, Kentucky Community and Technical Colleges - Hazard Campus

The USA Drone Port is the simple descriptive title of the NURRDC or the National Unmanned Research and Development Center. We are a group that recognized the need for a robotic development center that will have the ability to help entrepreneurs, educators, investors, manufactures, startups and many others, have a common location to experiment, test, build, assure proof of concept and all things dealing with unmanned, autonomous vehicles including, but not limited to drones (sUAS).

We are preparing the land, located on an abandoned mine location in Knott and Perry counties to house this one stop shop for innovation. Even though it is not constructed, we are teaching, training, flying, building and engaging at full speed. The drone port exists today! The one stop location will soon exist as well. We invite you to be a part of this amazing and engaging movement in our region and in the nation!

THE ORAL HISTORY PROJECT OF UTAH MINING

Jan Morse, Utah Abandoned Mine Land Program

Utah is blessed with rich mineral resources. President Abraham Lincoln called it “the treasure house of the nation.” Many of the mineral resources of the world are found in Utah, including the only domestic source of beryllium. The gold rush in the nineteenth century, coal mining for both domestic and sophisticated industrial use, and the uranium boom of the mid-twentieth century all left their marks on Utah’s history and residents.

The Utah Abandoned Mine Reclamation Program began using oral history as a form of cultural mitigation beginning in 1983. Oral history collection was sporadic and project-specific up through 2012. In 2013, we began an ongoing project to collect oral histories whenever we have an opportunity. We have learned that the personal impressions and perspectives of people who worked in the mines or were associated with the mining industry in some way provide an important part of the story of mining in Utah.

As we work with landowners and stakeholders to plan reclamation of past mining hazards, we are uniquely positioned to meet people who have stories to tell. We now have an efficient mechanism to follow through with recording these stories, publishing them online, and placing all collected material in the State Archive making these resources available to anyone who wants to research Utah’s mining history.

The oral history project is one component of our public education efforts, helping AMRP encourage the public to appreciate Utah’s mining history while learning to “Stay Out and Stay Alive.” Other outreach efforts include a web map of mining heritage sites, booths at community events, a workbook for fourth grade students to complement their Utah history curriculum, and an annual calendar of historic mining photos sent to our professional contacts.

PIONEER HEADFRAME - SAVING THE PAST WITH THE OSM PILOT PROGRAM

Gerard Schmidt, Senior Civil Engineer General, PA DEP

Finding the funds to save historical artifacts has been a difficult endeavor during AML reclamation work. We will look at using the OSM Pilot Program funding to revitalize an historic mining headframe and some associated equipment. The whole premise of the program is to provide an AML related economic benefit to the area where the money is used.

This steel headframe spent the first part of its life acting as a lift for bringing coal mine workers and mining equipment up from the coal mine in Northeast Pa. where it was originally built in Schuylkill County. It spent the better part of 50 years in this work location. Mining ended, the headframe and shaft took on a new role and then it was time for reclamation and its removal.

It was removed to the Pioneer Tunnel Mine Tour Complex for storage and hopefully later use there. The 2016 OSM Pilot program allotted Pennsylvania millions of dollars for AML reclamation and other economic projects related to the AML work. A request was sent to DEP BAMR for consideration of restoring the headframe and associated equipment from the Pioneer Tunnel Mine Tour Complex.

The Pilot program has specific criteria and a process to utilize the funds for restoration. OSM wants the project developed similar to a regular AML workup using a subgrant and ATP. The development must show economic benefit in the future. There are some specific items to be aware of that can slow down the process tremendously if not worked on early enough. The quality of the restoration is a consideration which costs more.

The head frame has been erected and will be painted and landscaped. Its purpose is to be a noticeable exhibit in the coal town area to draw new visitors to the tour and tell some more bygone history of coal mining in Pennsylvania.

MISSOURI LAND RECLAMATION POLLINATOR INITIATIVE MOVING HABITAT CONSERVATION FORWARD

Christopher Bobryk, Daniel Wedemeyer, Austin Rehagen, Vic Rackers, Brent Willeford and Mike Mueller
Missouri DNR - Land Reclamation Program, Abandoned Mine Land Unit

Improving pollinator habitat is a critical activity to achieve successful conservation efforts for land, water, and wildlife. The efficacy of enhancing the diversity of pollinator plant assemblages, particularly on abandoned mine lands, are to provide a more diverse and continuous progression of alternative food and shelter sources. Pollinator grouping, structure, and stability depend on various characteristics of the surrounding landscapes and the actual reclamation efforts. Additionally, quantifying the effectiveness of reclamation on habitat enhancement also has challenges due to expense of monitoring, length of time required for systems to recover, and choice in metrics. Therefore, the Missouri Department of Natural Resources-Land Reclamation Program (MDNR-LRP) has facilitated a pollinator-forward reclamation initiative for abandoned mine lands focused on establishing habitats that help reinstate the functional needs of pollinators. The goal of this initiative was to increase the ecological fitness of pollinator species (e.g. butterflies (Lepidoptera spp.), bees (Hymenoptera spp.), and bats (Chiroptera spp.)) by improving the quality, quantity, and connectivity of habitat on landscapes affected by historic mining activities. Specifically, the department focused on employing improved management tactics on sites undergoing reclamation, which included targeted landscape and site-specific forb diversity, broad-scale warm-season grass establishment, and bat cupola construction. Additionally, this initiative proposes a novel approach to systems monitoring using soundscape metrics as a tactic to obtain holistic measures of reclamation progress. This multi-objective approach will provide opportunities to: (i) Contribute to, or modify, existing regional conservation efforts by delineating site-specific areas to propagate plant species on disturbed landscapes, (ii) Expand the contiguity of beneficial habitat using abandoned mine lands, (iii) Support field data collection necessary for developing adaptive management strategies, and (iv) Foster interagency and community collaboration for promoting, protecting, and enjoying natural resources.

CITY OF PIKEVILLE, KENTUCKY SPECULATIVE BUILDING: ECONOMIC DEVELOPMENT AND ENGINEERING CHALLENGES ENCOUNTERED WHEN USING RECLAIMED SURFACE MINING SITES.

Sean Cochran, Executive Director of Economic Development, City of Pikeville
Bradley K. Slone, City Engineer, City of Pikeville

The City of Pikeville, Kentucky is in the process of building a speculative (spec) building on a reclaimed surface mining site owned by the city. The purpose of this building is to attract a manufacturing tenant for economic development within the city and nearby communities.

In order to maximize the opportunity for attracting a tenant, the building must be designed to ensure that it can readily accommodate as many different industrial processes as possible. In a number of areas, this means leaving room for flexibility is a must. Some factors to be considered include physical dimensions and load requirements of the building; having various utilities on site, but not in the building; whether to install a concrete pad; site layout; etc.

In addition, there are many engineering considerations involved when building on reclaimed surface mining sites. Among these are required road improvements, other access issues, and utility construction and supply.

With this site, however, the primary concern is preventing settlement at building site. The surface mining process has resulted a subsurface at the site made up of fill material that is heterogenous and irregular mixture of rock and sand of varying sizes with depths approaching one hundred feet. This material will settle unpredictably over time due to both the weight of the fill itself and to the migration of water through the material enlarging voids by dislocating finer particles. This requires mitigation under the building footprint itself and may present issues for utilities as well.

VERTI-BLOCK PRECAST CONCRETE RETAINING WALL BLOCKS IN ABANDONED MINE LAND AND RURAL APPLICATIONS - NOT JUST ANOTHER PRETTY (WALL) FACE

Paul Filipiak, P.E. Product Engineer Foster Supply Inc.

While gabion and pile walls are still options on abandoned mine land projects, the KY AML is continuing to use more of the precast concrete “big block” style of retaining wall blocks on remediation projects. Many of the KY AML projects are adjacent to homes. The gabion walls previously used were unsightly, and attracted mice and snakes. Large precast concrete retaining wall blocks offer a much more attractive solution, and are not prone to being inhabited by vermin.

Precast concrete retaining wall blocks are economical, durable, aesthetically pleasing options on a variety of projects, from commercial developments to rural applications on abandoned mine land, coal and gas industry projects. Being modular, they allow retaining wall construction on sites that may prove to be inaccessible by concrete trucks for a poured in place wall, or by tractor trailers and pile drivers for pile and lagging walls.

Verti-Block is the latest “big block” style of precast concrete retaining wall block to be approved by the Kentucky Transportation Cabinet for use on highway projects. It offers some unique advantages over the other big block products. Verti-Block’s larger size and internal drainage system offers the designer a block that can provide a cost effective retaining wall solution on a variety of projects. Verti-Block’s ease of installation is well suited to rural applications on abandoned mine land, coal and gas industry projects. Manufactured using wet-cast concrete gives Verti-Block the durability to be used in and along waterways. And Verti-Block’s aesthetics are certain to please anyone from home owners to developers of high-end commercial projects.

AARONS RUN ROAD LANDSLIDE EMERGENCY GARRETT COUNTY, MARYLAND

Tim Miller, Regulatory & Compliance Engineer III
Maryland Department of the Environment - Abandoned Mine Land Division

Maryland is a minimum program state and the Maryland Abandoned Mine Land Division (AMLD) faces many challenges from the legacy of past mining practices. On May 19, 2014, a well-used rural mountain roadway collapsed in Garrett County and County officials were forced to close the roadway. Access by citizens and commercial truck traffic was no longer possible and would require a 6 mile detour until repaired. The closure of Aarons Run Road affected many people living in the area plus a deep mine and surface mine operation that used the roadway to haul coal. The closure also affected emergency services response to the area.

AMLD was contacted by the County officials to investigate the collapse that appeared to be due to deep mines in the area. After visiting the site, the AMLD confirmed that the source of the problem was due to a landslide caused by an abandoned underground mine underneath and adjacent to the roadway. Over the course of the project, AMLD coordinated with Federal, State, and County agencies, investigated the nature of the problem, determined that the situation met the criteria for an emergency, moved quickly to evaluate possible reclamation solutions, developed designs, calculated estimated costs, obtained landowner permission, identified available funds, and completed reconstruction of the roadway in record time. All initial engineering designs pointed to a pile and lagging wall with tie-backs at an estimated cost of $1.5 million or more due to very difficult site constraints. The project was completed on November 21, 2014 at a total cost of $683,175.75 by excavating the entire slide and utilizing a rock buttress.

SMALL UNMANNED AIRCRAFT SYSTEMS (SUAS) COMPLIANCE MONITORING FROM A NEW PERSPECTIVE

Kyle Willard, Kentucky Department of Mine Reclamation and Enforcement

Kentucky Division of Mine Reclamation and Enforcement (DMRE) Kentucky DMRE recently began using a sUAS to supplement inspection and enforcement functions required to ensure surface and underground coal mining in Kentucky comply with the 1977 Federal Surface Mining Control Act (SMCRA). This session will explore the ups (and downs) of some of the missions and discuss plans for expanding sUAS use. Examples of 3-D models and point clouds generated from sUAS imagery will be presented.

UAS TECHNOLOGY AND REGULATIONS
UNMANNED AIRCRAFT SYSTEMS (UAS) ARE CHANGING THE WAY PEOPLE COLLECT DATA.

Glenn Anderson, Kentucky Department of Transportation

UAS technology is presenting opportunities for companies and challenges for regulators. The evolution of the aircraft and FAA regulations will be presented. Legal requirements and practical advice to agencies integrating this new tool into their workflow will be discussed.

FROM PEN AND PAPER TO GIS AND DRONES NEVADA'S AML INVENTORY PROCESS

Robert Ghiglieri Chief, Abandoned Mine Lands Nevada Division of Minerals

The Nevada Division of Minerals (NDOM) is legislatively mandated to identify and rank dangerous conditions at non-operational mines, as well as, secure hazards on Federal land that have no apparent owner. Nevada has the largest number of physical AML safety hazards in the US. There are an estimated 300,000 historic mining features in the state, 50,000 posing physical safety hazards. In addition to those, Nevada is also home to an estimated few thousand environmental and human health AML hazards. Nevada is currently the 4th largest gold producer in the world producing 5.5 million ounces of gold in 2016. Nevada also produces silver, gypsum, copper, barite, aggregates, lithium, molybdenum, and other commodities but we have no current or past coal production requiring a separate funding source from SMCRA.

Since the inception of NDOM's AML physical safety program in 1987, many of the methods used to identify AML hazards have drastically changed, but the overall goal of inventorying and securing remains the same. It was not until 2006 that a GPS was used for the first time during field work in Nevada. Now we are performing all inventorying digitally on tablets, incorporating drones, evaluating the use of LiDAR, and have remote real time access to our database. This presentation will cover our current and past techniques for hazard identification, prioritization of field work, proven field technologies, recent technological advancements, and ongoing financial challenges. We will also discuss the benefits of temporary securings and the goal of long term closures.

USE OF UAV TO EVALUATE REVEGETATION SUCCESS AT A HARDROCK MINE SUPERFUND SITE, COLORADO

Andrew Harley, Duraroot Environmental Consulting
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The Summitville Mine Superfund Site (SMSS) is a former 1400-acre open pit gold, copper and silver mine. The SMSS occupies a large expanse of alpine tundra and access is particularly difficult due to location within the Rio Grande National Forest within the San Juan Mountains of Southwest Colorado, its elevation of approximately 11,500 feet, and its area. Since 1992, the SMSS has undergone significant restoration and revegetation of mineralized parent material with the goal of establishing an ecologically productive and self-sustaining plant community to provide erosion control and reduce contaminant flow to groundwater.

Following site wide revegetation in 1999-2001, periodic monitoring using traditional pointintercept observations has been undertaken to provide a basis for determining reclamation success and identifying areas requiring maintenance work. Vegetation cover and an increase in species richness were used as measures of plant community development.

A periodic monitoring event undertaken in August 2017 included use of an Unmanned Aerial Vehicles (UAV). The UAV collected orthorectified images, digital elevation data, and IR vegetation images using a high-resolution IR and RGB cameras of the 1400-acre site. Survey grade ground control points were used to increase the precision and accuracy of these geospatial data sets. Statistical and spatial analysis was performed to evaluate the spatial distribution of the vegetative cover at multiple landscape scales; broad (ecosystem), mid (community compositions), and fine (species composition). These results will be used to establish a reporting strategy for long-term monitoring, allowing for recommendations that will improve site stability while reducing the cost of monitoring.

GEOPHYSICAL TOOLS FOR IMPROVEMENT OF SUBSURFACE DELINEATION OF ABANDONED MINE LANDS

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Precision agriculture using UAS (unmanned aerial systems) sensor technology is experiencing substantial growth in terms of capacity to extract information and in rates of adoption by farm and land managers everywhere. Low cost “natural RGB” and “nearinfrared” imaging devices coupled with low cost aerial platforms (drones) are providing very high spatial resolution images used to estimate crop health, a common example being the Normalized Difference Vegetation Index (NDVI). When collected over time, these products allow for dynamic adjustments in management practices and further processing yields models for evaluating other quantities such as carbon sequestration potential. Optimizing the use of these technologies in support of localized decisionmaking requires an understanding of how derived estimates of biophysical parameters vary in magnitude according to the spatial scale at which the measurements are acquired.

This current project utilizes low altitude visible and near-infrared data (VISIR) imagery collected at multiple reclaimed mine sites near Hindman, Ky for characterizing local biophysical attributes. UAS –based estimates are evaluated against satellite-based estimates of the same parameters derived from the Sentinel 2 Mission imagery. Preliminary results suggest that correlations between estimates of NDVI are generally positive and significant, suggesting a high potential for confident use in decision making.

SPATIOTEMPORAL ANALYSES OF WATER QUALITY AND VEGETATION GROWTH IN COAL MINE AREAS IN EASTERN KENTUCKY

Mr. Oguz Sariyildiz, Dr. Buddhi Gyawali, Mr. Jeremy Sandifer, Dr. Tilak Shresta, Ms. Prabisha Shresta
Kentucky State University

Kentucky is the third-largest coal-mine producer in the US. Coal production brings money as well as environmental impact to the state. Major impacts of surface coal mining are valley fills, acid drainage, natural land cover loss, hydrological pattern change and water quality degradation. This study aims to measure historical areal mining extent with remote sensing and analyze vegetation growth in mined and unmined sub-watersheds along with coal mine related water qualities (SO4 -2 , Alkalinity, Electrical Conductivity, Ca++, Mg++, Mn, Al, Fe). The study has been conducted in 27 sub-watersheds of Johnson Creek and Troublesome Creek watersheds in Perry, Magoffin, Knott, and Breathitt counties. We utilized 4-year interval Landsat images between 1986-2016 to extract composite classified NDVI maps. Then, we measured vegetation change from these maps. Beside remotely acquired data, water samples collected at drainage exit points of the sub-watersheds and analyzed for the water quality parameters. Pearson bivariate correlation analysis was performed among areal mining extent, water quality parameters, and reclamation age. We found high correlation between percentage of areal mining extent for watersheds and SO4 -2 , Alkalinity, Electrical Conductivity, Ca++, Mg++. Adjusted areal mining extent according to vegetation growth made the relationship stronger with the same parameters. We also found very strong correlation between age of reclamation and percentage of reclaimed forest.

ESTIMATION OF BIOMASS AND VEGETATION GROWTH ON THE RECLAIMED MINE SITES IN EASTERN KENTUCKY

Tilak Shrestha, Buddhi Gyawali, Jeremy Sandifer, Ken Bates
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This ongoing study explores land cover change in active mining and reclaimed areas in 2001 and 2011 in Kentucky’s Appalachian counties. As a part of the study Lidar data is used to estimate the forest area and height of canopy. The LandSat images taken in 2001 and 2011 were used to derive vegetation indices related to biomass measurements. An attempt is made to measure biomass of the forest using the Division of Forestry, Kentucky, provided Forestry inventory data and the indices measured using remote sensing data. This derived information will be used to estimate changes in the vegetation due to mining activities.

WATERSHED SCALE STUDY OF FOREST FRAGMENTATION IN FEDS CREEK-LEVISA FORK WATERSHED, PIKE COUNTY, KY

Prabisha Shresta and Buddhi Gyawali
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Economy in Eastern Kentucky is dependent on its coal resources, and surface coal mining is one of the major drivers of land cover change in the region. Large-scale land cover change, especially forest fragmentation, results in loss of forest functionality affecting forest health and sustainability. The main objective of this research is to investigate extent of forest fragmentation resulted by surface coal mining between 2010 and 2016 in Feds Creek–Levisa Fork watershed in Pike county, Kentucky. Landscape fragmentation v2.0 will be used to assess four main forest fragmentation categories: patch, edge, perforated and core. The results from this study is expected to detect any trends in forest fragmentation categories related to surface coal mining activities in the study area, identify effects of forest fragmentation in forest structure and biomass and assess forest fragmentation effects on watershed hydrology.

UNDERSTANDING THE IMPACT OF SPATIAL SCALE ON MEASUREMENTS OF BIOLOGICAL AND PHYSICAL PROPERTIES OF RECLAIMED AND FORMER MINE AREAS.

Jeremy Sandifer, Oguz Sariyildiz, Buddhi Gyawali, D'Andre Garrison, Jarod Jones
Kentucky State University

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UNDERSTANDING LANDSCAPE CHANGE AND PUBLIC PERCEPTIONS OF SURFACE MINING ON LOCAL ECONOMY, ENVIRONMENT AND HUMAN WELL-BEING IN EASTERN KENTUCKY

Panel Participants: Buddhi Gyawali, Oguz Sariyildiz, Tilak Shrestha, Prabisha Shrestha, Jeremy Sandifer
College of Agriculture Food Science and Sustainable Systems, Kentucky State University, Frankfort Kentucky

This presentation summarizes preliminary results of the land cover change, land fragmentation, use of unmanned aerial systems data for effective land use and management, environment and micro climate variation, and public perceptions on overall impacts of coal-mine and reclamation efforts in the local economy in the seven counties in Eastern Kentucky. Kentucky State University (KSU) has been conducting research since 2015 to study the impacts of natural resources extraction on environment and rural communities, as well as for advancing the body of knowledge and data extraction technology in environmental change. The results of this study are being utilized for the expansion of extension program in new counties, creation of databanks of satellite imageries, LiDAR, UAVs, and Extension curriculum for precision agriculture and alternative management of reclaimed properties, which will ultimately enhance synergy among KSU faculty and staff, local government, agencies, stakeholders, and local communities.


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